INTERACTIONS OF HIGH-TEMPERATURE COATINGS IN HOT CORROSION ENVIRONMENTS

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ABTRACT

High-temperature coatings such as MCrAlY-type or aluminide-type barriers coatings are used to protect metallic substrates from corrosion in various corrosive applications such as gas turbines and incinerators. The MCrAlY metallic coatings (where M is Ni, Co, or possibly Fe) are a mixture of chromium, aluminum, and yttrium (or other reactive elements). The primary oxide formed by this coating type is chromium oxide; increasing the Cr content in this metallic coating improves the Type II hot corrosion resistance while providing little improvement to Type I hot corrosion.

Aluminide coatings are formed by several processes to protect superalloys and depend primarily on the stability of aluminum oxide for its degree of protection in high-temperature environments. Aluminide coatings that provide excellent oxidation resistance may fail catastrophically in a environment where hot corrosion can occur.

Recent efforts to reduce operational costs by using less expensive fuels in marine gas turbines may seriously impact the performance of current and future high-temperature protective coatings. The increasing desire to raise processing temperatures in waste incineration units may require the development and implementation of new, corrosion-resistant coatings.

This paper will examine the compositional and structural variation of these protective coatings and their interactions with several corrosive species found in gas turbine and/or waste incinerator environments and offer some suggestions to improve the hot corrosion-resistance of protective, barrier coatings.